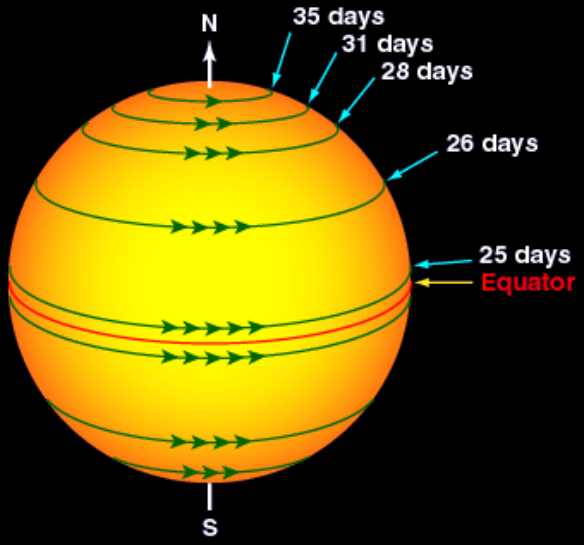
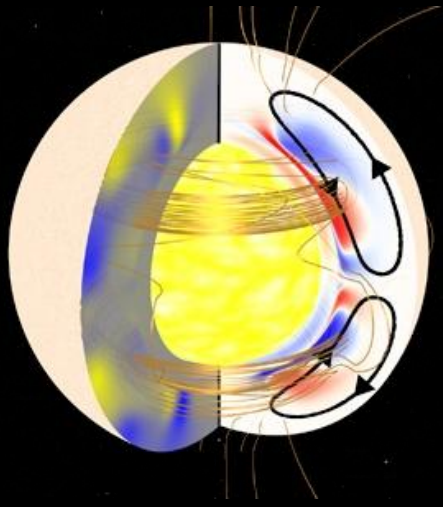
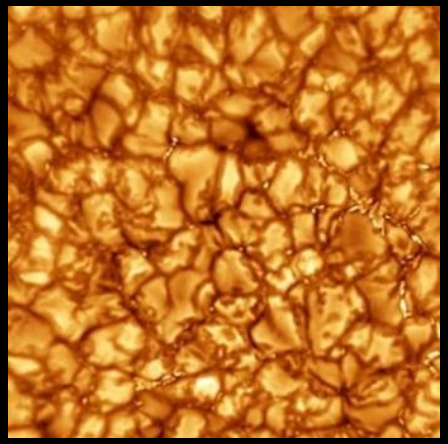
Understanding the Solar Magnetic Cycle



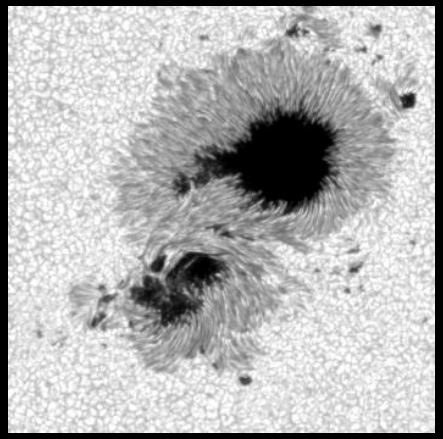
Differential Rotation



Meridional Flow



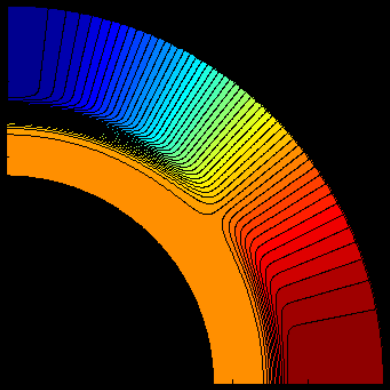
Turbulent Convection



Sunspot Eruption

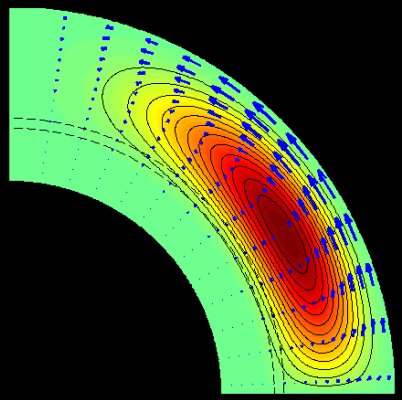
Modeling the Solar Magnetic cycle

Differential Rotation



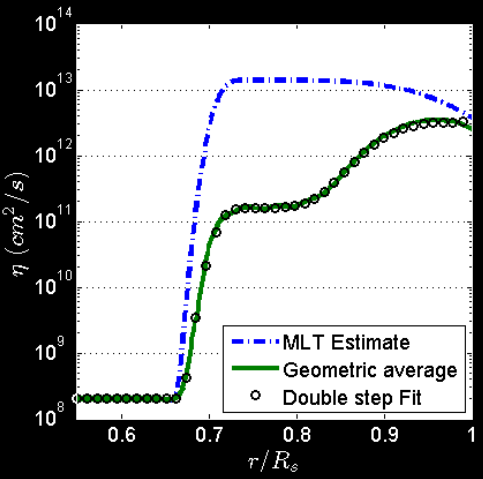
Charbonneau et al. 1999

Meridional Flow



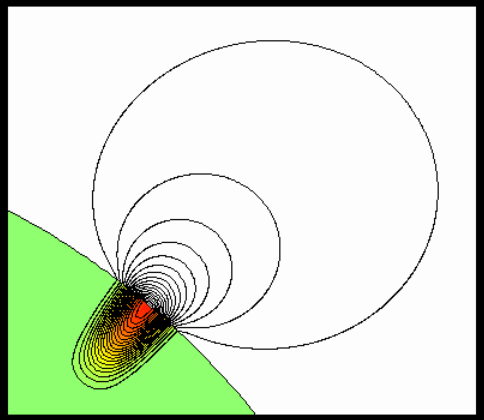
Muñoz-Jaramillo, Nandy & Martens 2009

Turbulent Diffusivity



Muñoz-Jaramillo, Nandy & Martens 2011

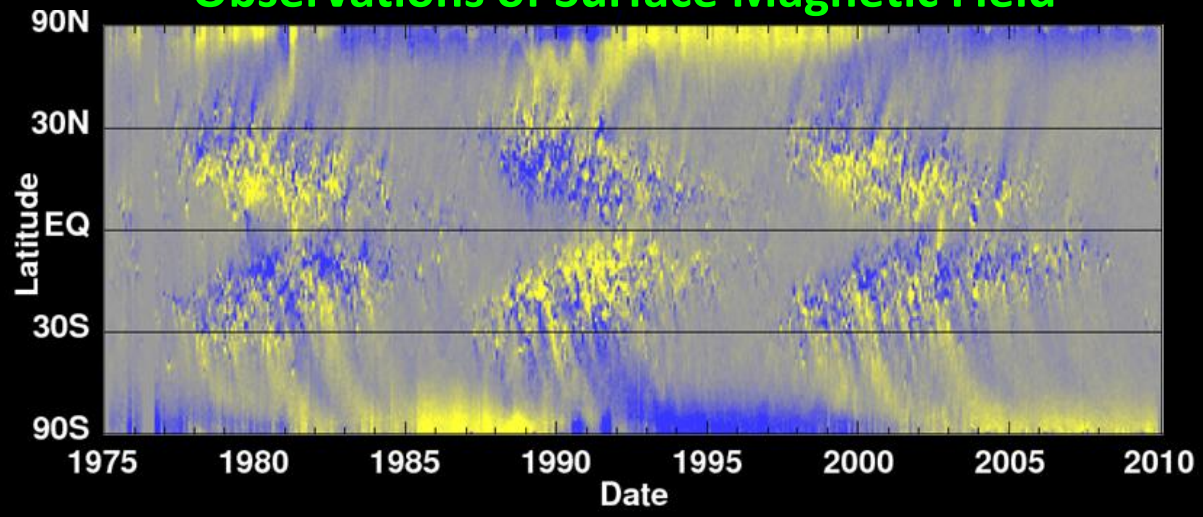
Sunspot Eruption



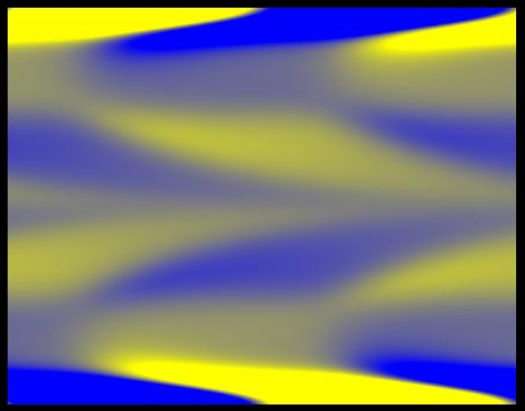
Muñoz-Jaramillo et al. 2010

How does our model compare with observations and other models?

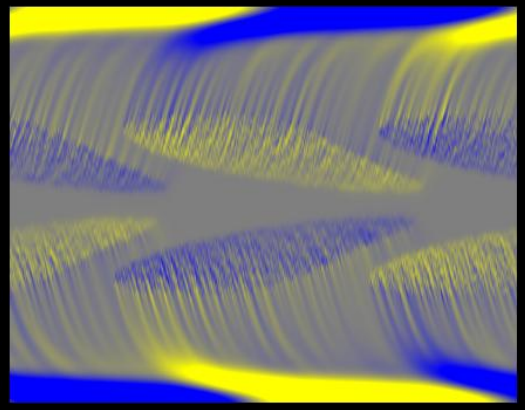
Observations of Surface Magnetic Field



Traditional Models



Improved Model



Understanding the Extended Solar Minimum

1. Large amount of days without sunspots.

Our model includes a realistic algorithm for sunspot eruption.

2. Weak polar field strength.

Our model captures successfully the dynamics of polar field generation